

Unit: Energetics

IB Expectations/ Assessment Criteria

DP Group 4: Chemistry, DP - Age 16-18, Objectives

It is the intention of all the Diploma Programme experimental science courses that students achieve the following objectives.

- 1. Demonstrate an understanding of: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology d. methods of presenting scientific information.
- 2. Apply and use: a. scientific facts and concepts b. scientific methods and techniques c. scientific terminology to communicate effectively d. appropriate methods to present scientific information.
- 3. Construct, analyse and evaluate: a. hypotheses, research questions and predictions b. scientific methods and techniques c. scientific explanations.
- 4. Demonstrate the personal skills of cooperation, perseverance and responsibility appropriate for effective scientific investigation and problem solving.
- 5. Demonstrate the manipulative skills necessary to carry out scientific investigations with precision and safety.

Approach

Significant concept(s) / Considerations

Practice driven, since the topic is very mathematical.

Calculations of enthalpy change
Calculate enthalpy change from enthalpy level diagrams.
Calculate Bond enthalpy.

Guiding Questions

Learner Profile

Is heat change a universal phenomenon?

- Knowledgeable
- Communicators
- Principled
- Balanced

Central Idea / Content

Learning Objectives

5.1 Exothermic and endothermic reactions.
5.2 Calculations of enthalpy changes
5.3 Hess's Law

Define the terms exothermic reaction, endothermic reaction and standard enthalpy change of reaction (ΔH_o).
State that combustion and neutralization are exothermic processes.

5.4 Bond enthalpy 15.1 Standard enthalpy changes of reaction 15.2 Born Haber cycle 15.3 Entropy 15.4 Spontaneity	<p>Apply the relationship between temperature change, enthalpy change and the classification of a reaction as endothermic or exothermic.</p> <p>Deduce, from an enthalpy level diagram, the relative stabilities of reactants and products, and the sign of the enthalpy change for the reaction.</p> <p>Calculate the heat energy change when the temperature of a pure substance is changed.</p> <p>Design suitable experimental procedures for measuring the heat energy changes of reactions.</p> <p>Calculate the enthalpy change for a reaction using experimental data on temperature changes, quantities of reactants and mass of water.</p> <p>Evaluate the results of experiments to determine enthalpy changes.</p> <p>Determine the enthalpy change of a reaction that is the sum of two or three reactions with known enthalpy changes.</p> <p>Define the term <i>average bond enthalpy</i>.</p> <p>Explain, in terms of average bond enthalpies, why some reactions are exothermic and others are endothermic.</p> <p>AHL</p> <p>Define and apply the terms <i>standard state</i>, <i>standard enthalpy change of formation</i> (ΔH)_{fo} and <i>standard enthalpy change of combustion</i> (ΔH)_{co}.</p> <p>Determine the enthalpy change of a reaction using standard enthalpy changes of formation and combustion.</p> <p>Define and apply the terms <i>lattice enthalpy</i> and <i>electron affinity</i>.</p> <p>Explain how the relative sizes and the charges of ions affect the lattice enthalpies of different ionic compounds.</p> <p>Construct a Born–Haber cycle for group 1 and 2 oxides and chlorides, and use it to calculate an enthalpy change.</p> <p>Discuss the difference between theoretical and experimental lattice enthalpy values of ionic compounds in terms of their covalent</p>
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	<p>character.</p> <p>Discuss the difference between theoretical and experimental lattice enthalpy values of ionic compounds in terms of their covalent character.</p> <p>State and explain the factors that increase the entropy in a system.</p> <p>Predict whether the entropy change (ΔS) for a given reaction or process is positive or negative.</p> <p>Calculate the standard entropy change for a reaction (ΔS_o) using standard entropy values (S_o) .</p> <p>Predict whether a reaction or process will be spontaneous by using the sign of ΔG_o.</p> <p>Calculate ΔG_o for a reaction using the equation $\Delta G_o = \Delta H_o - T\Delta S_o$ and by using values of the standard free energy change of formation, ΔG_{fo}.</p> <p>Predict the effect of a change in temperature on the spontaneity of a reaction using standard entropy and enthalpy changes and the equation $\Delta G_o = \Delta H_o - T\Delta S_o$.</p>
<p><u>Assessment</u></p> <p>Worksheets/Assignments</p> <p>Summative: Other Written Assessment</p> <p>Worksheets to assess students' learning on a daily basis.</p> <p>Quizzes and a unit test.</p> <p>Summative: Standardized Test</p> <p>Quizzes will be held on a regular basis and a unit Test will be held.</p> <p>Lab</p> <p>Summative: Lab Assignment</p> <p>Lab focusing on DCP and ICT (virtual lab).</p>	

Information Literacy & ICT	International Mindedness	TOK	
ICT Lab	Invention of alternative technologies for energy change to save the earth.		
Strategies / Activities / Differentiation	Resources		
Extra help for students having learning difficulties.	Chemistry Course companion Teacher assisted learning materials Independent research instruments Worksheets		
Unit Reflections			